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ARCTIC-YUKON-KUSKOKWIM REGION

1997 HERRING PROJECTIONS

By

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TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

Page

ARCTIC-YUKON-KUSKOKWIM REGION

Introduction

The Arctic-Yukon-Kuskokwim (AYK) Region includes eight commercial herring fishing districts located in coastal areas of the northeastern Bering Sea: the Security Cove, Goodnews Bay, Cape Avinof, Nelson Island, Nunivak Island, Cape Romanzof, Norton Sound and Port Clarence Districts.

The arrival of herring in the northeastern Bering Sea is greatly influenced by climate and oceanic conditions, particularly the extent and distribution of the Bering Sea ice pack. Most herring appear immediately after ice breakup which generally occurs between late April and mid-June. Spawning usually begins in the Security Cove District and generally progresses in a northerly direction. In some areas spawning may continue as late as July.

Aerial survey techniques have been used since 1978 in Bering Sea herring fisheries to estimate herring spawning biomass (Lebida and Whitmore 1985). However, it is often difficult to obtain biomass estimates from aerial surveys in the AYK Region because of poor survey conditions caused by unfavorable weather, ice conditions or turbid water. Herring school surface areas are recorded in 538 ft^2 relative abundance index (RAI) units. In the AYK Region, RAI units are converted to biomass based on water depth. Because purse seine gear is needed to estimate the conversion factors, and purse seine gear is not fished in the AYK Region, these conversion factors were estimated from sampling performed in the Togiak District. Ground surveys are conducted in some districts to obtain information on the distribution and density of kelp beds and herring spawn deposition.

During 1996, 87 aerial surveys totaling 79.7 hours of flight time were flown in the AYK Region: 11 (5.8 hours) in Security Cove, 12 (8.5 hours) in Goodnews Bay, 5 (3.6 hours) in Cape Avinof, 11 (3.8 hours) in Nelson Island, 10 (14.0 hours) in Nunivak Island, 5 (1.1 hours) in Jacksmith Bay, 9 (5.1 hours) in Cape Romanzof, and 24 (37.8 hours) in Norton Sound and Port Clarence combined. Only eighteen of these surveys were rated as being acceptable. A total biomass of 61,822 tons of herring was estimated to have been present in the surveyed portion of the AYK Region herring districts in 1996. The 1996 return is 20% below the 5-year average (1991-1995) of 74,124 tons. Ages 8 and 9 combined comprised 35% to 50% of the biomass for all districts with the exception of Nunivak Island. Ages 6 and 8 dominated the Nunivak Island biomass (46.3%). With the exception of Goodnews Bay, recruitment, in all Kuskokwim districts, was weaker than in 1995. In these districts, recruits, ages 2 through 5, comprised 23% to 29% of the return in numbers of fish. Goodnews Bay recruits represented 28% of the return, which is a slight increase over 1995. Relatively little recruitment was observed in either the Norton Sound or Cape Romanzof Districts (18% and 13%, respectively).

The Alaska Board of Fisheries established threshold biomass levels, below which harvests are not allowed under the Bering Sea Herring Fishery Management Plan (5 AAC 27.060), for all districts with the exception of the Port Clarence District. Exploitation rates are limited to a maximum of 20% in all areas. In some areas the Board of Fisheries has further restricted exploitation rates to protect subsistence harvests. All herring AYK districts open and close by Emergency Order authority to provide for an orderly fishery and allow periodic assessment of herring biomass. Fishing effort has been limited by a moratorium placed on entry into the Nelson Island, Nunivak Island, Cape Romanzof, and Norton Sound herring fisheries in 1987. All AYK Region commercial herring districts, except Security Cove and Port Clarence, are designated as superexclusive use areas.

The 1996 herring harvest for the AYK Region was approximately 11,986 tons with an estimated exvessel value of $8,730,000. This increase in both harvest and value compared to 1995 levels of 11,299 tons and $7,433,000 is primarily due to record harvests in Security Cove, Goodnews Bay, Cape Avinof, and near-record harvests at Norton Sound, and Nelson Island. The harvest is nearly twice the 5-year average (1991-1995) of 6,522 tons and the value is nearly three times the 5-year average of $2,944,000. The price paid to fishermen in AYK fishing districts for herring with 10% roe content was approximately $600 per ton in the Kuskokwim Area, $800 per ton in the Cape Romanzof District, and $650 per ton in the Norton Sound District plus or minus $60 a percentage point, and $50 per ton for bait-quality herring. Food and bait sales during the sac roe fishery totaled 266 tons, with the remaining harvest sold as sac roe product. Harvest identified as food and bait primarily occurs during the sac roe fisheries when fish are sold with a roe content that is below buyer's acceptable minimums. In some years, wastage occurs when fishermen abandon gillnets or cannot sell their catch. This amount is added to the total harvest and is included in calculations of exploitation rates. In 1996, 55 tons of herring were discarded.

A total of 1,152 fishermen participated in AYK sac roe herring fisheries during the 1996 season. This is the highest effort on record. Effort had been declining in recent years as fishermen have been discouraged by both low prices and fewer buyers than in previous years. There was no herring fishery in the Port Clarence District during the sac roe season in 1996. There has not been a commercial sac roe fishery in the Port Clarence District since 1988 due to a lack of buyers. In most years there has been a small bait fishery in the Port Clarence District.

Surveyed subsistence fishermen from selected Yukon-Kuskokwim River Delta villages harvested approximately 98 tons of herring.

Roe recoveries in the sac roe harvest ranged from 9.9% in the Nunivak Island District to 13.4% in the Cape Avinof District, with a combined regional roe recovery of 11.2%. An awareness among processors, managers and fishermen of the poor market conditions and the need for a high-quality product helped produce high roe percentages again this year. Managers attempted to limit period harvests to an amount that could be processed within three days. The 1996 total exploitation rate for the AYK Region was 19.4%. Exploitation rates ranged from 2.4% in the Nunivak Island District to 27.1% in the Security Cove District.

Gillnets are the only legal gear in the AYK Region with the exception of Norton Sound, where a small portion of the harvest is taken by beach seine. An attempt was made to sample at least 420 herring from each commercial gear type and district or subdistrict. The sampling goal for test fish catches was to sample a minimum of 60 herring per day or 420 per week from each district or subdistrict. Herring from test fish and commercial catches were sampled in all but the Port Clarence District to estimate age, sex, size, and sexual maturity of herring and to note the occurrence of other schooling fishes. A total of 16,270 herring from commercial, subsistence and test catches were sampled during the 1996 fishing season.

Biomass projections for each district using postseason escapement estimates, historic mean rates of survival, current mean weights for each age class and estimates of recruitment for each age class, suggest that the 1997 spawning biomass for the northeastern Bering Sea herring stocks (Security Cove to Norton Sound) will be approximately 46,192 tons with a projected harvest of 8,962 tons. This is a slight decline from the 1996 biomass of 61,822 tons. Districts with projected declines may be either those with poor aerial survey conditions in 1996 or those where a slight decline is expected as the predominant year class ages. These projections do not include age classes not yet seen in the fishery.

Variability in the quality of aerial survey assessments of biomass and deviations from the assumed survival or recruitment rates may result in the observed biomass being either above or below these projections. Harvest levels will be adjusted during the season according to observed herring spawning biomass. In addition, in accordance with the AYK Region harvest policy, newly recruited age classes will not be targeted by the commercial fishery. If it is not possible to determine herring abundance using aerial survey methods, stock abundance will be assessed using information from the projected biomass, test and commercial catches and spawn deposition observations.

Security Cove Sac Roe Fishery

Since 1981, the estimated biomass of herring in the Security Cove District has ranged from 2,300 tons in 1987 to 8,267 tons in 1981 (Figure 1). During the 1996 season, eleven aerial surveys were flown in the district between May 1 and May 17 to estimate herring biomass and observe spawning activity. Seven of these surveys were flown under acceptable conditions. On May 13, 5,008 tons of herring were observed during an aerial survey. The total biomass estimate for the Security Cove District of 6,867 tons was calculated by combining the May 13 aerial survey estimate and the commercial harvest (Table 1). A total of 19.7 miles of spawn was observed in the district with peak spawning activity (6.0 miles) on May 10.

In 1996, there were two commercial periods on May 11 and May 12 for a total fishing time of 5.5 hours. The catch consisted of 1,854 tons of sac roe herring with an average roe recovery of 11.6%, 26 tons of bait-quality herring, and 5 tons of discarded herring. Fourteen processors paid $1,251,000 to 326 permit holders. The harvest was 27.1% of the estimated biomass.

The Security Cove test fish crew sampled 1,556 fish caught with variable mesh gillnets from May 7 to May 29 (Table 1). Ages 8 and 9 dominated the biomass (24.0% and 23.3% respectively) and the return in numbers of fish (21.3% and 17.5% respectively). Age 9 and older herring comprised 42.4% of the biomass. Recruit herring represented 24.7% of the population. A sample of 420 herring was taken from the commercial catch. Age 8 herring comprised the largest age group in the harvest biomass. Age 9 and older herring made up 59.7% of the catch by weight. Recruit herring comprised less than 1% of the harvest.

The 1997 projected return to the Security Cove District is 4,625 tons ((Figure 1; Table 1). A 20% exploitation rate would result in a harvest of 925 tons. A larger catch may occur if the 1997 biomass assessment is greater than the projection. Commercial fishing will not be allowed until the observed biomass reaches 1,200 tons or significant spawning activity is observed. The occurrence and length of fishing periods will depend on stock strength, fishing effort, and spawning activity. Ages 6, 7, and 9 herring are expected to comprise well over one-half of the biomass. Age 9 and older herring are expected to comprise over one-third of the biomass.

Goodnews Bay Sac Roe Fishery

The Goodnews Bay District consists of the waters of Goodnews Bay inside the north and south spits and a line between the Ukfigag River and the Tunulik River. Since 1981, the estimated biomass of herring in the Goodnews Bay District has ranged from 2,000 tons in 1987 to 6,315 tons in 1996 (Figure 2). During the 1996 season, twelve aerial surveys were flown in the district between May 1 and June 4. Six surveys were flown under acceptable conditions. On May 8, 4,482 tons were observed during an aerial survey. During a survey on May 17, 4,488 tons were observed. The Department's test fish crew documented spawning activity on May 6. The total biomass estimate of 6,315 tons was calculated by adding fish seen on the May 17 survey that were not present on May 8 (Table 2). Two and one-half miles of spawn was observed during aerial surveys of the district.

In 1996, 1,204 tons were harvested in eleven commercial periods totaling 44 hours of fishing time. The catch consisted of 1,191 tons of sac roe-quality herring with an average roe content of 12.5% and 13 tons of bait-quality herring. Five processors paid $895,000 to 182 permit holders. The exploitation rate was 19.1% of the available biomass.

The Goodnews Bay test fish crew sampled 1,439 herring caught with variable mesh gillnets from May 6 to May 29 for biological data. Ages 8 and 9 dominated the biomass (24.3% and 18.8% respectively) and ages 5 and 8 dominated the return in numbers of fish (22.2% and 21.8% respectively) (Table 2). Age 9 and older herring comprised 41.5% of the biomass. Recruit herring represented 28.5% of the return in numbers of fish. A sample of 475 herring was taken from the commercial catch. The largest age class in the harvest was age 8 (31.7%). Age 9 and older herring made up 60.5% of the catch. Recruit herring comprised less than 1% of the harvest.

The management strategy for this district will be similar to that planned for Security Cove. The season will open and close by emergency order when a biomass of 1,200 tons is observed or

spawning activity occurs. The 1997 projected return of herring to the Goodnews Bay District is 4,752 tons (Figure 2; Table 2). A 20% exploitation rate would result in a harvest of 950 tons. A larger catch may occur if the 1997 biomass assessment is greater than the projection. Ages 6 and 9 herring are expected to comprise nearly one-half of the biomass. Age 9 and older herring are expected to comprise approximately one-half of the biomass.

Cape Avinof Sac Roe Fishery

The Cape Avinof District consists of all waters extending inshore of Kikegteg, Pingurbek and Kwigluk Islands from the Ishkowik River to the Ursukfak River. Aerial surveys have been conducted by the department in the Cape Avinof area since 1985 and biomass estimates have ranged from 1,225 tons in 1987 to 4,500 tons in 1996 (Figure 3). During 1996, five surveys were flown in the Cape Avinof District from May 19 to June 2. One of these was flown under acceptable aerial survey conditions. During an aerial survey on June 2, 1,276 tons were observed. Aerial survey estimates of herring biomass in the Cape Avinof District have only been successful in four of the past ten years. The last year in which the herring biomass was estimated by survey was in 1992 when 3,446 tons were observed. In other years, the preseason projection or commercial catch rates have been used for estimating herring biomass. The area consists of shallow mud flats. Water turbulence caused by wind and wave action obscures visibility of the bottom through the water column. Catch rates in 1996 were the highest in the history of the fishery. Local fishermen and the Department's test fishing crew noted a high abundance of herring as indicated by spawn deposition, catchability and comments from local residents, as compared to previous years. An estimate of the 1996 Cape Avinof herring biomass of 4,500 tons was made post-season based on the estimated proportion harvested (Table 3).

Commercial fishing in the Cape Avinof District began in 1988. The 1996 commercial season consisted of eleven commercial openings from May 19 to May 26 for a total fishing time of 55 hours. The harvest totaled 820 tons of sac roe-quality herring with an average roe content of 13.4%. Two processors paid $659,000 to 161 fishermen. The exploitation rate was 18.2% of the available biomass.

The Cape Avinof test fish crew sampled 1,245 fish caught with variable mesh gillnets from May 18 to June 5 for biological data. Age 8 dominated the biomass (24.4%) and age 6 dominated in numbers of fish (22.6%) (Table 3). Age 9 and older herring comprised 29.9% of the biomass. Recruit herring represented 28.9% of the returning population. Eight hundred and seventy-one herring were sampled from the commercial catch. Age 9 herring dominated the harvest (24.8%). Age 9 and older herring made up 73.5% of the catch. Recruit herring comprised less than 1% of the harvest.

Either significant spawning activity or a biomass of 500 tons must be observed before the commercial herring season can be opened. The season will open and close by emergency order. The projected 1997 biomass for the Cape Avinof District is 3,737 tons ((Figure 3; Table 3). The exploitation rate will be set at no greater than 15% because of the limited data base for this area and the priority of subsistence fishing. Assuming a 15% commercial exploitation rate, the

projected harvest would be 561 tons of herring. Age 6, 7, and 9 herring are expected to dominate the returning biomass. Age 9 and older herring are expected to comprise approximately 40% of the biomass.

Nelson Island Sac Roe Fishery

The Nelson Island District consists of all waters north of Chinigyak Cape and south of the southeast tip of Kigigak Island and east of 165° 30' W. longitude. The commercial harvest of herring began in the Nelson Island District in 1985. Since 1985, biomass estimates of herring in the Nelson Island District have ranged from 2,385 tons in 1991 to 9,500 tons in 1985 (Figure 4). In 1996, eleven aerial surveys were flown in the Nelson Island area between May 12 and June 2. Only two of these surveys were made under acceptable conditions. During a survey flown on May 15, 1,350 tons of herring were observed in the district. Since there were no acceptable surveys after May 15, the preseason forecasted biomass of 6,638 tons was used as the total biomass estimate for 1996 (Table 3). A total of 3.4 miles of spawn was observed during aerial surveys of the district. Peak spawning was observed on May 15 when 1.6 miles of spawn were sighted.

During the 1996 season, 986 tons of sac roe-quality herring with an average roe content of 11.4% and 44 tons of bait were harvested. The fishery consisted of five commercial openings from May 16 to May 18 for a total fishing time of 25 hours. Three processors paid approximately $679,000 to 109 permit holders. The exploitation rate was 15.5% of the available biomass. A total of 94.7 tons of herring was harvested for subsistence use by 96 Nelson Island fishing families in 1996.

Test fishing with variable mesh gillnets occurred from May 19 through June 13. The Nelson Island test fish crew sampled 1,899 herring caught in variable mesh gillnets for biological data. Age 8 dominated the returning biomass (22.6%) and ages 6 and 8 dominated in numbers of fish (20.4% and 21.1%, respectively), (Figure 4). Age 9 and older herring comprised 44.8% of the biomass. Recruit herring represented 23.4% of the spawning population. A total of 424 herring were sampled from the commercial catch. Age 9 herring dominated the harvest (22.4%). Age 9 and older herring made up 79.3% of the catch by weight. Recruit herring comprised less than 1% of the harvest.

In the Bering Sea Herring Fishery Management Plan, the Alaska Board of Fisheries set a minimum biomass threshold of 3,000 tons necessary for a commercial herring fishery in the Nelson Island District. The inseason estimate of herring biomass must exceed the threshold level before a commercial fishery can be allowed. The spawning biomass projected to return to the Nelson Island District in 1997 is 5,094 tons (Figure 4; Table 4). At an exploitation rate of 15%, the harvest will be 764 tons of herring. A larger catch may occur if the 1997 biomass assessment is greater than the projection. Age 9 herring are expected to be the dominant age group in the biomass; age 7 herring are expected to dominate in numbers of fish. Age 9 and older herring are expected to comprise over one-half of the biomass in 1997.

To provide additional protection for the subsistence harvest of herring, the following guidelines will be followed:

1. The commercial fishery will not be allowed to take more than 15% of the herring biomass, compared to up to 20% for most other fisheries having stocks of similar size and condition.

2. Periodic closures of the commercial fishery will be scheduled, during which time only subsistence fishing will be allowed.
3. Several important subsistence use areas occur throughout the district, including the waters around Cape Vancouver. Specific areas may be closed to commercial fishing to insure the adequacy of subsistence harvests.

4. The department will by all available means, including input from local residents, insure the adequacy of subsistence herring harvests during the commercial fishing season.

Nunivak Island Sac Roe Fishery

The Nunivak Island District consists of all waters extending three miles seaward of mean low water from Kikoojit Rocks to the westernmost point of Cape Mendenhall. Commercial fishing for herring in the Nunivak Island District began in 1985. Since 1985, the estimated biomass in the Nunivak Island District has ranged from 422 tons in 1990 to 6,000 tons in 1986 (Figure 5). In 1996, ten aerial surveys were flown in the Nunivak Island District between May 12 and June 2. During an aerial survey on May 14, 805 tons of herring were observed. Total biomass in the district was assumed to be 4,195 tons based on the projected return from the 1995 escapement (Table 5). About 3.9 miles of spawn were observed during aerial surveys with peak spawning (1.1 miles) occurring on May 12. An industry spotter pilot reported seeing approximately 5.3 miles of spawn on May 13.

Commercial fishing for herring in the Nunivak Island District began in 1985. To provide for an orderly fishery and to allow for periodic assessment of herring biomass, the fishery has opened and closed by emergency order. The Nunivak Island District had six commercial herring periods in 1996 from May 14 to June 5 for a total fishing time of 254 hours. Fishermen harvested 61 tons of sac roe herring with an average roe content of 9.9% and 40 tons of bait. Two processors purchased $39,000 worth of herring from 24 permit holders. The exploitation rate was 2.4% of the projected biomass or 7.8% of the peak aerial survey biomass.

Test fishing with variable mesh gillnets occurred from May 12 through June 4. From this catch, 1,054 herring were sampled for biological data. Ages 6 and 8 dominated the biomass (22.8% and 23.5%, respectively) and age 6 dominated the return in numbers of fish (27.6%) (Table 5). Age 9 and older herring comprised 31.4% of the biomass. Recruit herring represented 25.3% of the spawning population in numbers. A total of 663 herring were sampled from the commercial catch. Age 8 herring dominated the harvest biomass, and dominated the catch in numbers of fish.

Herring, aged 9 and older, comprised 74.6% of the catch sample by weight. Recruit herring comprised less than 1% of the harvest.

The projected biomass of herring returning to the Nunivak Island District in 1997 is 3,801 tons (Figure5; Table 5). A 20% exploitation rate would result in a 760 ton harvest. A larger catch may occur if the 1997 biomass assessment is greater than the projection. Age 7 herring is expected to be the dominant age group. Age 9 and older herring are expected to comprise approximately 44% of the return.

Cape Romanzof Sac Roe Fishery

The Cape Romanzof District consists of all waters between the latitudes of Dall Point and 62° N. However commercial fishing is only open within Kokechik Bay. Due to excessive water turbidity in the Cape Romanzof area, it is generally not possible to estimate herring biomass using aerial survey techniques. Based on information from limited aerial surveys, test and commercial catches, spawn deposition, and comparisons with other herring spawning areas of similar size, the Cape Romanzof District herring biomass is estimated to be between 3,000 and 8,000 tons. Nine aerial surveys were flown during the 1996 season from May 14 through June 4. A total of 5.1 hours were spent surveying the district. None of these surveys were flown under acceptable survey conditions. The largest quantity of herring observed during an aerial survey was 401 tons on May 22. Based on spawn deposition study results and herring age composition, the 1996 biomass of herring in the Cape Romanzof District was estimated postseason to be 6,000 tons (Table 6).

Daily qualitative spawn deposition surveys were conducted from May 14 until June 7. A light deposition of herring spawn was first observed on May 13 in Kokechik Bay. Artificial spawning substrates used in a quantitative spawn deposition study were located in the same area as in 1992 through 1995. Forty platforms, covered with an artificial spawning substrate, were placed just north of the department's field camp on May 14. Spawn deposited on the substrate was removed and weighed daily at low tide. Daily removal of spawn allowed measurements of new spawn deposition and decreased the problem of spawn loss due to wave action and desiccation observed in previous studies. The largest spawn depositions within the study area occurred on May 14, 23, and 24. The spawn deposition index of 5,599 g obtained this year was the largest since the study was initiated in 1992. The spawn deposition index was 2,470 g in 1992, 3,454 g in 1993, 4,056 g in 1994,and 4,985 in 1995. Although the spawn deposition this year was the largest, it is unknown whether the study area results are indicative of the total spawning biomass within the entire district.

The 1996 commercial fishery in Cape Romanzof consisted of ten periods between May 17 and May 25 for 34 hours of fishing time. The catch consisted of 750.3 tons of herring sac roe with a roe recovery of 10.61% and 1.4 tons of bait. Historically, harvests have ranged from 300 to 1,800 tons (Figure 6). Fishing gear in 1996 was restricted to one 50-fathom gillnet per vessel throughout the commercial season. Sixty-three permit holders participated in the 1996 fishery.

Local Alaskan residents (defined as residents of Chevak, Hooper Bay, and Scammon Bay) accounted for 95% (60 permits) of the effort and 96% (720 tons) of the harvest. Three companies, represented by one processing vessel and seven tenders, paid $638,300 to fishermen during the 1996 season. The harvest was 12.5% of the estimated biomass.

A subsistence harvest of 3 tons was estimated to have been taken by 29 fishing families from the Yukon Delta villages of Hooper Bay, Chevak and Scammon Bay in 1996. In addition, 624 pounds of spawn-on-kelp *(fucus)* were harvested for subsistence use by 18 families. A total of 64 fishing households were contacted out of 221 identified households, therefore the reported catch represents only these households and not the entire Yukon Delta.

The Department's test fish crew at Cape Romanzof sampled 1,675 herring which were caught from May 14 through June 6 with variable mesh gillnets. Age 8 herring dominated the return in both biomass (30.8%) and numbers of fish (30.6%) (Table 6). Age 9 and older herring comprised 48.5% of the biomass. Recruit herring represented 12.9% of the spawning population. A total of 650 herring were sampled from the commercial harvest. Age 8 herring dominated the harvest biomass (24.1%). Age 9 and older herring made up 73.1% of the catch. No recruit-age herring were observed in the commercial sample.

The projected return for 1997, based upon limited data, is 4,508 tons which would result in a 902 ton harvest at a 20% exploitation rate (Figure 6; Table 6). Age 9 herring are expected to dominate the biomass. Age 9 and older herring are expected to comprise nearly two-thirds of the return. Emergency order authority will be used to regulate the occurrence and length of fishing periods. It is likely that fishing gear will be restricted to no more than 50 fathoms and one gillnet per vessel by emergency order. Aerial biomass assessment cannot be used to determine the opening of commercial fishing due to typically poor survey conditions caused by turbid water. Therefore, spawn deposition observations and test and commercial catch rates will be used to determine timing and duration of commercial fishing periods. If stock abundance is judged to be lower or higher than the projection, the projected harvest of 902 tons will be modified accordingly.

Norton Sound Sac Roe Fishery

The Norton Sound District consists of all waters of Alaska between the westernmost tip of Cape Douglas and Canal Point Light. Historically, the primary spawning areas within Norton Sound have been from Stuart Island to Tolstoi Point. Additional spawning areas have been documented along Cape Denbigh and several bedrock outcroppings along the northern shore of Norton Sound between Bald Head and Topkok. Use of these areas increases when sea ice has remained near shore in the traditional areas into June.

Since 1978, herring biomass estimates in the Norton Sound District have ranged from 5,291 tons in 1978 to 57,974 tons in 1992 (Figure 7). During 1996, 24 surveys were flown between May 13 and June 13. Aerial survey conditions were generally rated from poor to unsatisfactory during the 1996 herring season. No surveys were flown under acceptable survey conditions. Herring were first sighted during an aerial survey on May 16 and a heavy spawn was first observed on May 22.

The 1996 herring biomass for Norton Sound of 26,596 tons was calculated by combining the peak survey of 20,376 tons with the harvest taken prior to the survey and the 50 tons of estimated wastage. The Norton Sound biomass estimate was changed postseason to the projected biomass of 27,307 tons since the peak survey was flown in unacceptable conditions and the projected biomass was greater.

The 1996 Norton Sound herring fishery opened by emergency order on May 24. During the sac roe season, there were two gillnet openings for a total fishing time of 14 hours and one beach seine opening for a total of 3 hours of fishing. The total harvest during the sac roe fishery was approximately 6,220 tons of herring, consisting of 6,061 tons of sac roe herring, 109 tons of bait-quality herring, and 50 tons of wasted herring. Since 1981, catches, including waste, have averaged 4,663 tons.

There were 287 fishermen who made at least one delivery during the season. This is the greatest number of participants since the 1990 season. The large fishing effort this year is in part due to the record harvest in 1995. During the 1996 season, 281 fishermen used gillnets, landing a total of 5,581 tons. The harvest consisted of 5,472.5 tons of sac roe-quality herring with an average sac roe recovery of 10.8%, and 109 tons of bait. Eight fishermen participated in the beach seine fishery, but only six made deliveries, landing 588.9 tons of herring. The average sac roe recovery for the beach seine caught herring was 9.2%. The average sac roe recovery for all gear types was 10.6%. The total value of the herring harvest to Norton Sound fishermen was approximately $4,569,275. Ten companies registered 12 processors and 61 tenders to operate in Norton Sound. The Norton Sound biomass was exploited at 22.8%.

Two Department field crews were operational during the 1996 season. One crew operated from Cape Denbigh and the second crew operated from Klikitarik. Test fishing was conducted in the Unalakleet area as time allowed. Test fish crews sampled 2,621 herring caught with variable mesh gillnets from May 21 through June 9 for biological data. Age 8 herring comprised 37.2% of the biomass and 34.4% of the return in numbers of fish (Table 7). The biomass consisted of 37.3% age 9 and older herring. Recruit herring represented 17.7% of the return in numbers of fish. A total of 1,339 herring were sampled from the commercial harvest. Herring, age 9 and older, comprised (53.1%) of the gillnet harvest. The harvest was dominated by age 8 herring (46.1%). Age 8 herring comprised 39.8% of beach seine catches. There was less than 1% recruit-aged herring in the gillnet sample and recruits comprised only 9.4% of the beach seine sample.

The Norton Sound projected return is 19,675 tons (Figure 7; Table 7). A 20% exploitation rate would result in a harvest of 3,935 tons. Age 9 herring are expected to comprise 36% of the returning biomass. Age 9 and older herring are expected to comprise nearly two-thirds of the biomass. Inseason assessment of herring biomass will supersede projected biomass for management of the Norton Sound herring fishery except where weather prevents obtaining an inseason estimate. The beach seine harvest is, by regulation, 10% of the projected harvest, or 394 tons. The 1997 herring fishery will be opened by emergency order. The fishery will close by emergency order when up to 20% of the available herring biomass has been harvested. Varied harvest rates may be applied to individual subdistricts based on biomass distribution, roe quality, weather, and sea ice conditions.

Port Clarence Sac Roe Fishery

The Port Clarence District consists of all waters between Cape Douglas and Cape Prince of Wales. Generally, it is not possible to survey this district due to ice, water stain, and poor weather. In addition, it is difficult to identify herring due to the large numbers of saffron cod, whitefish, and other pelagic species typically present in the area. A record biomass for this district of 1,652 tons was sighted during an aerial survey in 1992. In 1996, three aerial surveys were flown in the district but no herring were spotted.

There has been no commercial sac roe fishing in the Port Clarence District since 1988 because buyers have not been present in the district. However in most years there has been a small bait fishery. In 1996, three gillnet and one beach seine fishermen harvested 5,446 pounds (2.7 tons) of bait from June 7 to June 19. Fishermen were paid 40 cents per pound.

The Department does not generally project an outlook for the Port Clarence fishery due to the lack of data on Port Clarence herring and the very limited scope of the fishery. The guideline harvest of 165 tons established by the Board of Fisheries in 1981 will determine the allowable harvest in 1997. This harvest guideline is based on two years research by the department in both the Port Clarence and Kotzebue Districts. Even though this guideline has not appeared in the regulation book since 1984, it still represents the best estimate of harvestable biomass at this time.

Table 1. Security Cove District year/age class composition of the 1996 herring harvest, escapement, and total run biomass and the 1997 projected biomass by weight and number of fish.

1996 Total Run Summary

		Harvest		Escapement		Total Run				
Year Class	Age Class	Biomass (tons)	Number of Fish	Biomass (tons)	Number of Fish	Biomass (tons)	Number of Fish	Estimated Weight (g)	Percent by Weight	Percent by Number
1994	2	0	0	0	0	0	0	50	0.0	0.0
1993	3	0	0	15	197,117	15	197,117	70	0.2	0.7
1992	4	0	0	243	2,299,703	243	2,299,703	96	3.5	7.8
1991	5	0	0	605	4,730,818	605	4,730,818	116	8.8	16.1
1990	6	18	82,704	821	4,472,898	839	4,555,602	167	12.2	15.5
1989	7	99	475,547	498	1,999,371	597	2,474,918	219	8.7	8.4
1988	8	632	2,605,173	1,013	3,636,878	1,644	6,242,051	239	23.9	21.3
1987	9	599	2,253,681	994	2,871,371	1,593	5,125,052	282	23.2	17.5
1986	10	100	372,168	47	65,871	147	438,039	304	2.1	1.5
1985	11	111	413,519	126	287,342	236	700,862	306	3.4	2.4
1984	12	158	516,899	186	446,786	344	963,685	324	5.0	3.3
1983	13	62	186,084	223	602,386	285	788,470	328	4.2	2.7
1982	14	8	20,676	112	285,951	120	306,627	354	1.7	1.0
1981	15	42	124,056	114	270,179	156	394,235	358	2.3	1.3
1980	16	16	41,352	10	24,354	26	65,706	361	0.4	0.2
1979	17	16	41,352	0	0	16	41,352	356	0.2	0.1
Totals & Means:		1,859	7,133,211	5,008	22,191,026	6,867	29,324,237	212	100.0	100.0

1997 Projection Summary

					Projection				
Year Class	Age Class	Recruitment Schedule	1995 Escapement	Survival Rates	Projected Weight (g)	Biomass (tons)	Number of Fish	Percent by Weight	Percent by Number
1995	2	0.00	0	0.949	50	0	0	0.0	0.0
1994	3	0.43	144,134	0.944	70	0	0	0.0	0.0
1993	4	0.86	5,441,073	0.936	96	42	398,082	0.9	2.1
1992	5	0.97	4,882,552	0.924	116	316	2,471,260	6.8	12.9
1991	6	1.00	2,107,965	0.906	167	804	4,368,910	17.4	22.7
1990	7	1.00	4,215,931	0.881	219	978	4,052,446	21.2	21.1
1989	8	1.00	2,666,486	0.845	239	464	1,761,046	10.0	9.2
1988	9	1.00	504,470	0.793	282	955	3,071,344	20.6	16.0
1987	10	1.00	576,538	0.722	304	762	2,277,572	16.5	11.9
1986	11	1.00	666,622	0.628	306	16	47,566	0.3	0.2
1985	12	1.00	378,353	0.514	324	64	180,537	1.4	0.9
1984	13	1.00	306,286	0.388	328	83	229,424	1.8	1.2
1983	14	1.00	144,134	0.267	354	91	233,425	2.0	1.2
1982	15	1.00	36,034	0.167	358	30	76,292	0.7	0.4
1981	16	1.00	36,034	0.096	361	18	45,201	0.4	0.2
1980	17	1.00	0	0.051	356	1	2,343	0.0	0.0
Totals & Means:			22,106,611		218	4,625	19,215,447	100.0	100.0

Table 2. Goodnews Bay District year/age class composition of the 1996 herring harvest, escapement, and total run biomass and the 1997 projected biomass by weight and number of fish.

1996 Total Run Summary

		Harvest		Escapement		Total Run				
Year Class	Age Class	Biomass (tons)	Number of Fish	Biomass (tons)	Number of Fish	Biomass (tons)	Number of Fish	Estimated Weight (g)	Percent by Weight	Percent by Number
1994	2	0	0	0	0	0	0	50	0.0	0.0
1993	3	0	0	3	31,247	3	31,247	98	0.1	0.2
1992	4	0	0	207	1,218,651	207	1,218,651	154	3.3	6.1
1991	5	6	21,836	922	4,430,928	928	4,452,764	189	14.7	22.2
1990	6	38	131,016	572	2,306,287	610	2,437,303	227	9.7	12.2
1989	7	50	152,852	362	1,222,037	412	1,374,889	272	6.5	6.9
1988	8	382	1,055,406	1,151	3,303,616	1,533	4,359,022	319	24.3	21.8
1987	9	247	640,522	940	2,437,354	1,187	3,077,876	350	18.8	15.4
1986	10	71	167,409	193	457,540	264	624,949	383	4.2	3.1
1985	11	144	327,540	324	734,874	467	1,062,414	399	7.4	5.3
1984	12	137	283,868	110	231,715	247	515,583	435	3.9	2.6
1983	13	60	131,016	177	337,696	238	468,712	460	3.8	2.3
1982	14	44	87,344	79	147,012	123	234,356	478	2.0	1.2
1981	15	25	50,951	44	74,039	68	124,990	497	1.1	0.6
1980	16	0	0	18	31,247	18	31,247	514	0.3	0.2
1979	17	0	0	9	15,624	9	15,624	529	0.1	0.1
Totals & Means:		1,204	3,049,759	5,111	16,979,869	6,315	20,029,628	286	100.0	100.0

1997 Projection Summary

					Projection				
Year Class	Age Class	Recruitment Schedule	1995 Escapement	Survival Rates	Projected Weight (g)	Biomass (tons)	Number of Fish	Percent by Weight	Percent by Number
1995	2	0.00	0	0.949	50	0	0	0.0	0.0
1994	3	0.43	18,844	0.944	98	0	0	0.0	0.0
1993	4	0.86	1,922,046	0.936	154	11	63,105	0.2	0.4
1992	5	0.97	1,644,153	0.924	189	275	1,317,584	5.8	9.1
1991	6	1.00	662,202	0.906	227	1,043	4,167,780	21.9	28.7
1990	7	1.00	2,491,610	0.881	272	626	2,089,496	13.2	14.4
1989	8	1.00	1,773,865	0.845	319	378	1,076,370	8.0	7.4
1988	9	1.00	206,183	0.793	350	1,076	2,789,904	22.7	19.2
1987	10	1.00	281,952	0.722	383	816	1,933,309	17.2	13.3
1986	11	1.00	575,914	0.628	399	145	330,390	3.1	2.3
1985	12	1.00	346,720	0.514	435	221	461,721	4.7	3.2
1984	13	1.00	494,792	0.388	460	60	118,986	1.3	0.8
1983	14	1.00	245,065	0.267	478	69	130,857	1.5	0.9
1982	15	1.00	195,576	0.167	497	21	39,223	0.5	0.3
1981	16	1.00	56,531	0.096	514	7	12,387	0.1	0.1
1980	17	1.00	47,109	0.051	529	2	3,006	0.0	0.0
Totals & Means:			10,962,563		297	4,752	14,534,117	100.0	100.0

Table 3. Cape Avinof District year/age class composition of the 1996 herring harvest, escapement, and total run biomass and the 1997 projected biomass by weight and number of fish.

1996 Total Run Summary

		Harvest		Escapement		Total Run				
Year Class	Age Class	Biomass (tons)	Number of Fish	Biomass (tons)	Number of Fish	Biomass (tons)	Number of Fish	Estimated Weight (g)	Percent by Weight	Percent by Number
1994	2	0	0	0	0	0	0	59	0.0	0.0
1993	3	0	0	32	314,112	32	314,112	93	0.7	1.9
1992	4	0	0	151	1,024,996	151	1,024,996	134	3.4	6.1
1991	5	1	6,497	651	3,514,859	652	3,521,356	168	14.5	20.9
1990	6	19	67,184	865	3,735,220	884	3,802,404	211	19.7	22.6
1989	7	27	88,427	310	1,168,019	338	1,256,446	244	7.5	7.5
1988	8	169	500,754	927	3,037,134	1,096	3,537,889	281	24.4	21.0
1987	9	204	543,265	315	895,035	518	1,438,300	327	11.5	8.5
1986	10	51	131,692	158	413,871	209	545,562	347	4.6	3.2
1985	11	134	318,864	109	259,763	244	578,627	382	5.4	3.4
1984	12	144	328,694	54	117,675	198	446,369	403	4.4	2.7
1983	13	40	79,400	46	102,454	85	181,854	426	1.9	1.1
1982	14	20	37,084	29	62,109	49	99,193	446	1.1	0.6
1981	15	10	18,542	15	31,055	25	49,597	464	0.6	0.3
1980	16	0	0	17	33,064	17	33,064	480	0.4	0.2
1979	17	0	316	0	0	0	0	493	0.0	0.0
Totals & Means:		820	2,120,719	3,680	14,709,366	4,500	16,829,769	243	100.0	100.0

1997 Projection Summary

					Projection				
Year Class	Age Class	Recruitment Schedule	1995 Escapement	Survival Rates	Projected Weight (g)	Biomass (tons)	Number of Fish	Percent by Weight	Percent by Number
1995	2	0.00	0	0.949	59	0	0	0.0	0.0
1994	3	0.43	310,402	0.944	93	0	0	0.0	0.0
1993	4	0.86	2,684,979	0.936	134	94	634,354	2.5	4.7
1992	5	0.97	3,749,214	0.924	168	198	1,067,140	5.3	7.9
1991	6	1.00	886,862	0.906	211	762	3,274,800	20.4	24.3
1990	7	1.00	2,956,556	0.881	244	910	3,384,109	24.4	25.1
1989	8	1.00	1,014,326	0.845	281	319	1,028,791	8.5	7.7
1988	9	1.00	429,008	0.793	327	925	2,564,860	24.7	19.5
1987	10	1.00	448,955	0.722	347	272	709,942	7.3	5.8
1986	11	1.00	503,277	0.628	382	126	298,856	3.4	2.3
1985	12	1.00	259,397	0.514	403	73	163,209	1.9	1.5
1984	13	1.00	28,815	0.388	426	28	60,426	0.8	0.7
1983	14	1.00	22,168	0.267	446	20	39,701	0.5	0.3
1982	15	1.00	76,490	0.167	464	8	16,571	0.2	0.1
1981	16	1.00	43,234	0.096	480	3	5,195	0.1	0.0
1980	17	1.00	15,520	0.051	493	2	3,181	0.0	0.0
Totals & Means:			13,429,204		256	3,737	13,251,135	100.0	100.0

Table 4. Nelson Island District year/age class composition of the 1996 herring harvest, escapement, and total run biomass and the 1997 projected biomass by weight and number of fish.

1996 Total Run Summary

		Harvest		Escapement		Total Run				
Year Class	Age Class	Biomass (tons)	Number of Fish	Biomass (tons)	Number of Fish	Biomass (tons)	Number of Fish	Estimated Weight (g)	Percent by Weight	Percent by Number
1994	2	0	0	0	0	0	0	70	0.0	0.0
1993	3	0	988	47	443,370	47	444,358	96	0.7	1.9
1992	4	1	8,892	135	919,993	137	928,885	134	2.1	4.0
1991	5	15	83,982	707	3,923,824	722	4,007,807	164	10.9	17.4
1990	6	47	190,690	999	4,500,205	1,046	4,690,895	202	15.7	20.4
1989	7	21	66,199	194	742,645	215	808,843	241	3.2	3.5
1988	8	209	585,769	1,292	4,278,520	1,501	4,864,289	280	22.6	21.1
1987	9	240	617,387	764	2,205,766	1,004	2,823,153	323	15.1	12.3
1986	10	92	223,439	186	509,875	278	733,315	343	4.2	3.2
1985	11	133	300,366	304	731,560	437	1,031,926	384	6.6	4.5
1984	12	169	361,060	378	864,571	547	1,225,632	405	8.2	5.3
1983	13	111	226,545	310	653,971	421	880,516	433	6.3	3.8
1982	14	36	72,833	92	188,432	128	261,265	444	1.9	1.1
1981	15	27	51,519	100	199,516	127	251,036	457	1.9	1.1
1980	16	13	24,278	6	11,084	19	35,362	490	0.3	0.2
1979	17	11	18,208	0	0	11	18,208	524	0.2	0.1
Totals & Means:		1,125	2,832,156	5,513	20,173,334	6,638	23,005,490	262	100.0	100.0

1997 Projection Summary

					Projection				
Year Class	Age Class	Recruitment Schedule	1995 Escapement	Survival Rates	Projected Weight (g)	Biomass (tons)	Number of Fish	Percent by Weight	Percent by Number
1995	2	0.00	0	0.949	70	0	0	0.0	0.0
1994	3	0.43	106,155	0.944	96	0	0	0.0	0.0
1993	4	0.86	4,443,357	0.935	134	132	896,267	2.6	5.2
1992	5	0.97	7,305,674	0.923	164	177	982,864	3.5	5.7
1991	6	1.00	1,740,103	0.906	202	807	3,622,867	15.9	21.1
1990	7	1.00	6,843,435	0.881	241	1,085	4,076,286	21.3	23.7
1989	8	1.00	3,582,733	0.845	280	202	653,973	4.0	3.8
1988	9	1.00	906,832	0.793	323	1,285	3,613,210	25.2	21.0
1987	10	1.00	710,152	0.723	343	662	1,750,054	13.0	10.2
1986	11	1.00	933,658	0.629	384	156	368,487	3.1	2.1
1985	12	1.00	343,462	0.515	405	206	460,444	4.0	2.7
1984	13	1.00	293,625	0.389	433	213	445,341	4.2	2.6
1983	14	1.00	113,350	0.269	444	125	254,656	2.4	1.5
1982	15	1.00	187,004	0.169	457	26	50,651	0.5	0.3
1981	16	1.00	142,874	0.098	490	18	33,738	0.4	0.2
1980	17	1.00	37,742	0.052	524	1	1,082	0.0	0.0
Totals & Means:			27,690,157		269	5,094	17,209,921	100.0	100.0

Table 5. Nunivak Island District year/age class composition of the 1996 herring harvest, escapement, and total run biomass and the 1997 projected biomass by weight and number of fish.

1996 Total Run Summary

		Harvest		Escapement		Total Run				
Year Class	Age Class	Biomass (tons)	Number of Fish	Biomass (tons)	Number of Fish	Biomass (tons)	Number of Fish	Estimated Weight (g)	Percent by Weight	Percent by Number
1994	2	0	0	0	0	0	0	70	0.0	0.0
1993	3	0	0	8	73,568	8	73,568	96	0.2	0.5
1992	4	0	0	83	551,759	83	551,759	137	2.0	3.6
1991	5	0	513	585	3,254,863	585	3,255,376	163	13.9	21.2
1990	6	3	9,755	953	4,220,395	956	4,230,150	205	22.8	27.6
1989	7	2	8,215	258	911,383	261	919,598	257	6.2	6.0
1988	8	21	59,045	965	3,067,588	986	3,126,633	286	23.5	20.4
1987	9	12	31,833	375	1,053,293	388	1,085,125	324	9.2	7.1
1986	10	3	8,215	119	304,448	122	312,663	354	2.9	2.0
1985	11	8	19,510	146	348,329	155	367,839	381	3.7	2.4
1984	12	15	34,913	197	443,277	213	478,191	403	5.1	3.1
1983	13	14	30,806	131	281,857	145	312,663	421	3.5	2.0
1982	14	12	26,185	146	304,870	159	331,055	435	3.8	2.2
1981	15	8	16,430	82	167,490	90	183,920	445	2.2	1.2
1980	16	2	5,134	34	68,433	37	73,568	453	0.9	0.5
1979	17	0	0	9	18,392	9	18,392	460	0.2	0.1
Totals & Means:		101	250,555	4,094	15,069,944	4,195	15,320,499	248	100.0	100.0

1997 Projection Summary

					Projection				
Year Class	Age Class	Recruitment Schedule	1995 Escapement	Survival Rates	Projected Weight (g)	Biomass (tons)	Number of Fish	Percent by Weight	Percent by Number
1995	2	0.00	45,971	0.949	70	0	0	0.0	0.0
1994	3	0.43	61,294	0.944	96	0	0	0.0	0.0
1993	4	0.86	3,401,843	0.936	137	22	148,572	0.6	1.2
1992	5	0.97	4,780,968	0.924	163	106	589,195	2.8	4.6
1991	6	1.00	1,040,795	0.906	205	680	3,007,940	17.9	23.7
1990	7	1.00	3,405,856	0.881	257	1,083	3,823,678	28.5	30.1
1989	8	1.00	1,386,770	0.845	286	253	802,746	6.7	6.3
1988	9	1.00	380,669	0.793	324	925	2,590,578	24.3	20.4
1987	10	1.00	681,088	0.722	354	326	835,472	8.6	6.6
1986	11	1.00	854,076	0.628	381	92	219,842	2.4	1.7
1985	12	1.00	646,809	0.514	403	97	218,855	2.6	1.7
1984	13	1.00	453,655	0.388	421	106	227,623	2.8	1.8
1983	14	1.00	333,488	0.267	435	52	109,220	1.4	0.9
1982	15	1.00	243,967	0.167	445	40	81,339	1.1	0.6
1981	16	1.00	181,462	0.096	453	14	28,021	0.4	0.2
1980	17	1.00	30,647	0.051	460	3	6,583	0.1	0.1
Totals & Means:			17,929,359		272	3,801	12,689,663	100.0	100.0

Table 6. Cape Romanzof District year/age class composition of the 1996 herring harvest, escapement, and total run biomass and the 1997 projected biomass by weight and number of fish.

1996 Total Run Summary

		Harvest		Escapement		Total Run				
Year Class	Age Class	Biomass (tons)	Number of Fish	Biomass (tons)	Number of Fish	Biomass (tons)	Number of Fish	Estimated Weight (g)	Percent by Weight	Percent by Number
1994	2	0	0	0	0	0	0	50	0.0	0.0
1993	3	0	0	20	187,927	20	187,927	94	0.3	1.0
1992	4	0	0	41	266,231	41	266,231	139	0.7	1.4
1991	5	0	0	385	1,973,238	385	1,973,238	177	6.4	10.5
1990	6	15	54,867	617	2,521,360	632	2,576,227	223	10.5	13.7
1989	7	6	19,365	165	595,104	171	614,469	253	2.9	3.3
1988	8	182	519,625	1,666	5,246,308	1,847	5,765,933	291	30.8	30.6
1987	9	147	390,526	878	2,537,021	1,025	2,927,546	318	17.1	15.5
1986	10	63	158,147	323	908,316	387	1,066,463	329	6.4	5.7
1985	11	67	158,147	272	673,407	339	831,553	370	5.7	4.4
1984	12	131	296,929	571	1,362,474	702	1,659,403	384	11.7	8.8
1983	13	73	158,147	123	281,891	196	440,038	405	3.3	2.3
1982	14	41	87,142	114	250,570	155	337,712	417	2.6	1.8
1981	15	18	35,502	51	109,624	69	145,127	432	1.2	0.8
1980	16	8	16,137	23	46,982	30	63,119	437	0.5	0.3
1979	17	1	3,227	0	0	1	3,227	349	0.0	0.0
Totals & Means:		752	1,897,761	5,248	16,960,454	6,000	18,858,214	289	100.0	100.0

1997 Projection Summary

					Projection				
Year Class	Age Class	Recruitment Schedule	1995 Escapement	Survival Rates	Projected Weight (g)	Biomass (tons)	Number of Fish	Percent by Weight	Percent by Number
1995	2	0.00	0	0.949	50	0	0	0.0	0.0
1994	3	0.43	10,279	0.944	94	0	0	0.0	0.0
1993	4	0.86	781,172	0.935	139	58	379,442	1.3	2.8
1992	5	0.97	1,202,594	0.923	177	56	286,893	1.2	2.1
1991	6	1.00	308,357	0.906	223	456	1,857,374	10.1	13.5
1990	7	1.00	3,504,997	0.881	253	637	2,283,848	14.1	16.6
1989	8	1.00	2,117,388	0.845	291	168	524,048	3.7	3.8
1988	9	1.00	719,501	0.793	318	1,551	4,430,507	34.4	32.2
1987	10	1.00	760,615	0.723	329	730	2,012,872	16.2	14.6
1986	11	1.00	2,662,153	0.629	370	268	656,440	5.9	4.8
1985	12	1.00	1,017,580	0.515	384	179	423,842	4.0	3.1
1984	13	1.00	626,994	0.389	405	313	701,810	6.9	5.1
1983	14	1.00	328,915	0.269	417	50	109,768	1.1	0.8
1982	15	1.00	185,014	0.169	432	32	67,353	0.7	0.5
1981	16	1.00	143,900	0.098	437	9	18,537	0.2	0.1
1980	17	1.00	0	0.052	349	2	4,585	0.0	0.0
Totals & Means:			14,369,458		297	4,508	13,757,323	100.0	100.0

Table 7. Norton Sound District year/age class composition of the 1996 herring harvest, escapement, and total run biomass and the 1997 projected biomass by weight and number of fish.

1996 Total Run Summary

		Harvest				Escapement		Total Run				
Year Class	Age Class	Gillnet (tons)	B. Seine (tons)	Total (tons)	Total (number)	Biomass (tons)	Number of Fish	Estimated Weight (g)	Biomass (tons)	Number of Fish	Percent by Weight	Percent by Number
1994	2	0	0	0	0	0	0	53	0	0	0.0	0.0
1993	3	0	0	0	0	62	716,448	78	62	716,448	0.2	0.7
1992	4	0	0	0	0	75	622,999	110	75	622,999	0.3	0.6
1991	5	8	38	46	229,712	2,516	15,419,217	149	2,562	15,648,929	9.4	16.3
1990	6	37	76	113	427,297	2,200	10,964,776	184	2,313	11,392,073	8.5	11.9
1989	7	250	84	334	1,075,890	1,614	6,448,036	235	1,948	7,523,926	7.1	7.8
1988	8	2,334	244	2,579	7,632,411	7,584	25,387,195	279	10,163	33,019,606	37.2	34.4
1987	9	870	53	922	2,556,334	1,792	5,420,088	309	2,715	7,976,423	9.9	8.3
1986	10	696	45	741	1,936,486	2,074	5,825,037	329	2,815	7,761,524	10.3	8.1
1985	11	657	40	697	1,735,705	911	2,367,395	356	1,608	4,103,100	5.9	4.3
1984	12	464	22	486	1,122,918	1,268	3,083,843	378	1,754	4,206,762	6.4	4.4
1983	13	144	9	153	364,283	733	1,713,246	387	886	2,077,529	3.2	2.2
1982	14	85	3	88	192,134	190	436,099	401	278	628,233	1.0	0.7
1981	15	50	0	50	101,332	41	93,450	424	91	194,782	0.3	0.2
1980	16	10	0	10	21,833	14	31,150	404	24	52,983	0.1	0.1
1979	17	0	0	0	0	14	31,150	411	14	31,150	0.1	0.0
Totals & Means:		5,606	614	6,220	17,396,336	21,087	78,560,131	258	27,307	95,956,466	100.0	100.0

1997 Projection Summary

					Projection				
Year Class	Age Class	1995 Escapement	Recruitment Schedule	Survival Rates	Projected Weight (g)	Biomass (tons)	Number of Fish	Percent by Weight	Percent by Number
1995	2	0	0.00	0.914	53	0	0	0.0	0.0
1994	3	0	0.43	0.908	78	0	0	0.0	0.0
1993	4	3,758,539	0.86	0.900	110	168	1,392,759	0.9	2.1
1992	5	8,361,462	0.97	0.889	149	106	649,381	0.5	1.0
1991	6	6,621,207	1.00	0.873	184	2,851	14,041,762	14.5	21.5
1990	7	36,483,573	1.00	0.853	235	2,479	9,574,443	12.6	14.6
1989	8	9,494,173	1.00	0.825	279	1,692	5,496,951	8.6	8.4
1988	9	13,170,333	1.00	0.790	309	7,129	20,946,975	36.2	32.0
1987	10	4,592,626	1.00	0.744	329	1,552	4,279,160	7.9	6.5
1986	11	9,401,497	1.00	0.686	356	1,698	4,332,080	8.6	6.6
1985	12	7,177,265	1.00	0.616	378	677	1,624,270	3.4	2.5
1984	13	2,358,097	1.00	0.533	387	810	1,898,722	4.1	2.9
1983	14	937,060	1.00	0.443	401	404	913,846	2.1	1.4
1982	15	453,084	1.00	0.349	424	90	193,017	0.5	0.3
1981	16	0	1.00	0.261	404	15	32,642	0.1	0.0
1980	17	164,758	1.00	0.185	411	4	8,130	0.0	0.0
Totals & Means:		102,973,675			273	19,675	65,384,137	100.0	100.0

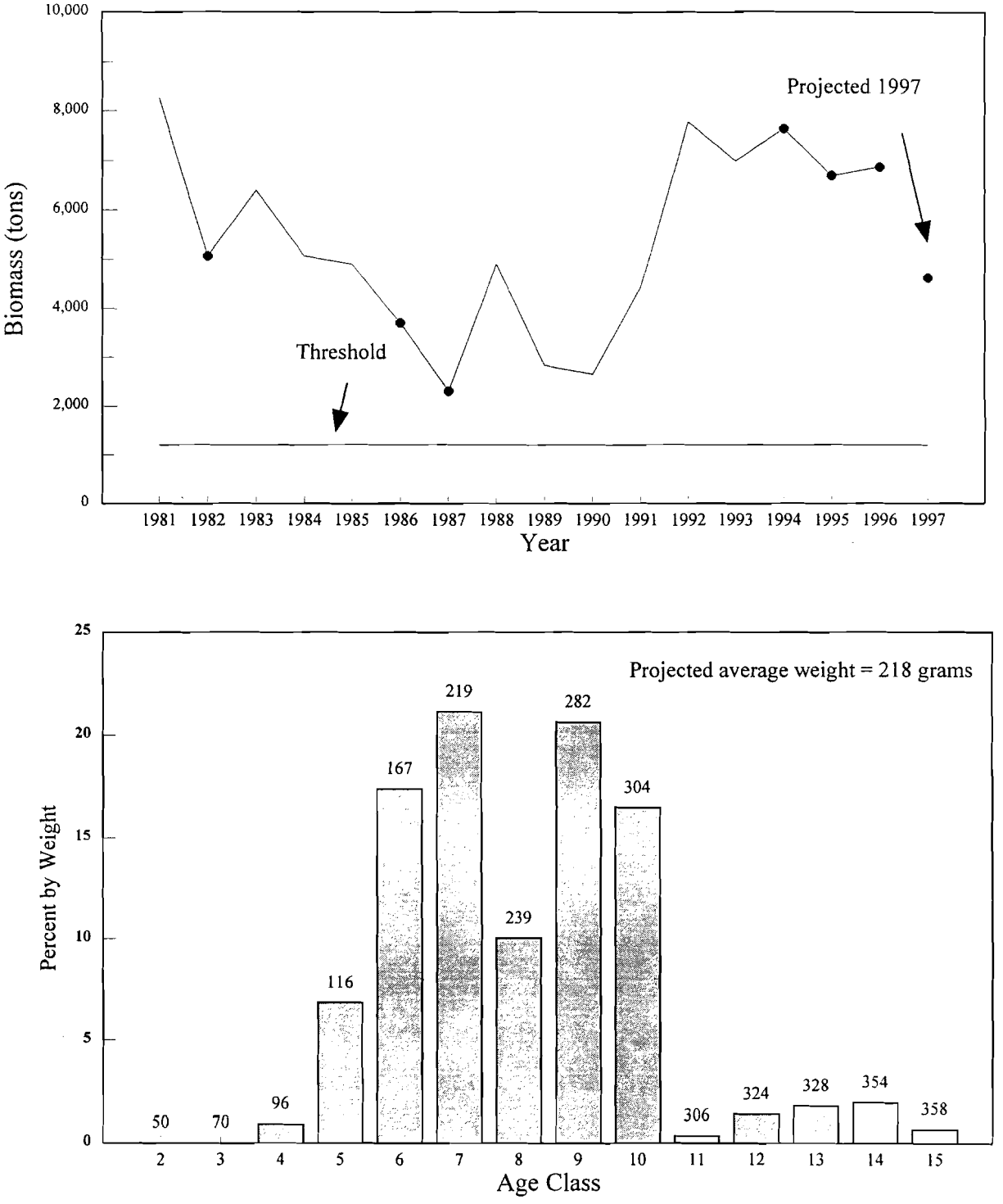

Figure 1. Security Cove District herring biomass, 1981-1996, with 1997 projected biomass (top) and age composition by weight of the 1997 projected biomass (bottom) showing the projected weight at age. In some years (•), it was not possible to obtain an aerial survey estimate of biomass; therefore the preseason projection or some other method was used to estimate biomass.

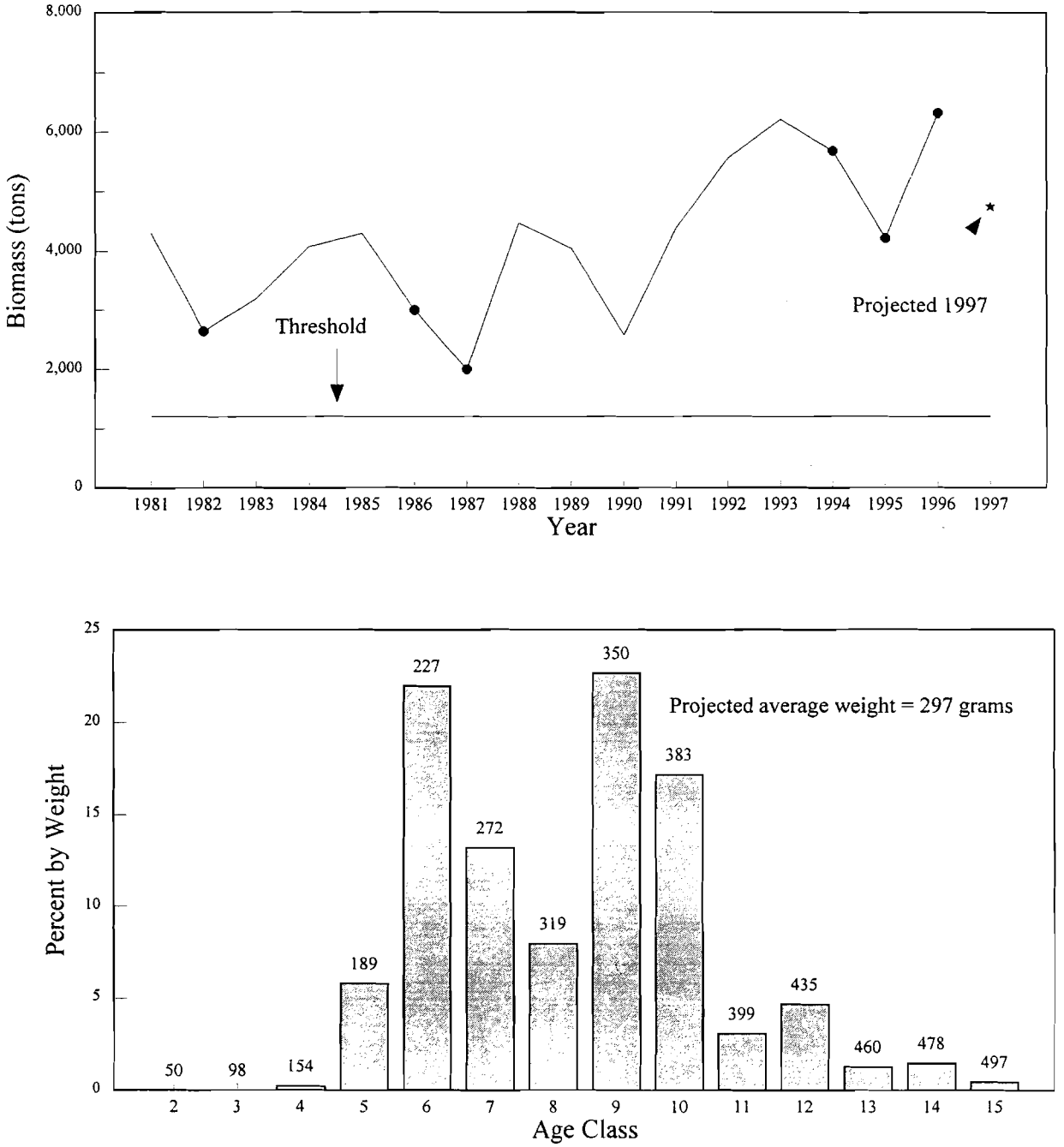

Figure 2. Goodnews Bay District herring biomass, 1981-1996, with 1997 projected biomass (top) and age composition by weight of the 1997 projected biomass (bottom) showing the projected weight at age. In some years (•), it was not possible to obtain an aerial survey estimate of biomass; therefore the preseason projection or some other method was used to estimate biomass.

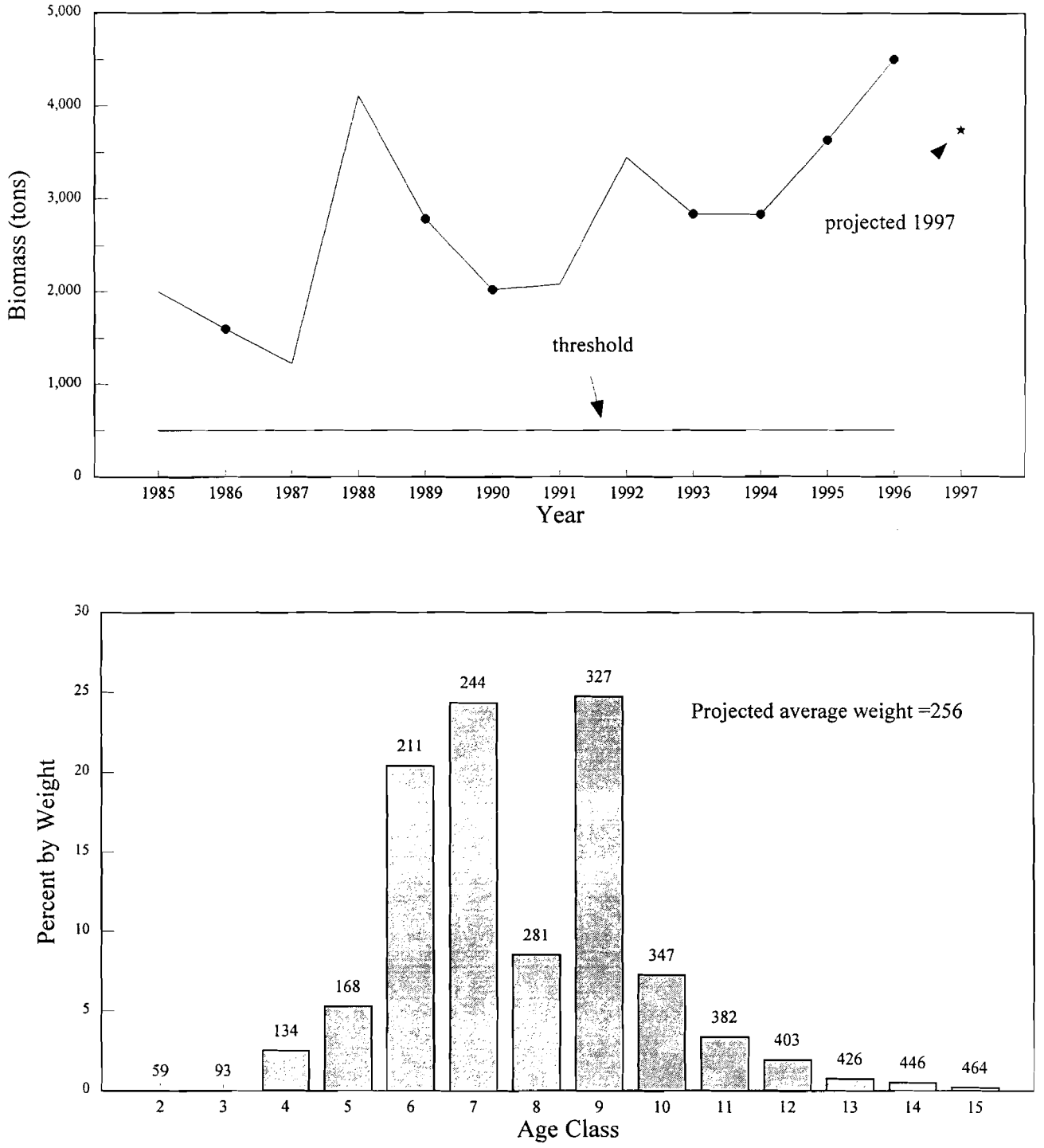

Figure 3. Cape Avinof District herring biomass, 1985-1996, with 1997 projected biomass (top) and age composition by weight of the 1997 projected biomass (bottom) showing the projected weight at age. In some years (•), it was not possible to obtain an aerial survey estimate of biomass; therefore the preseason projection or some other method was used to estimate biomass.

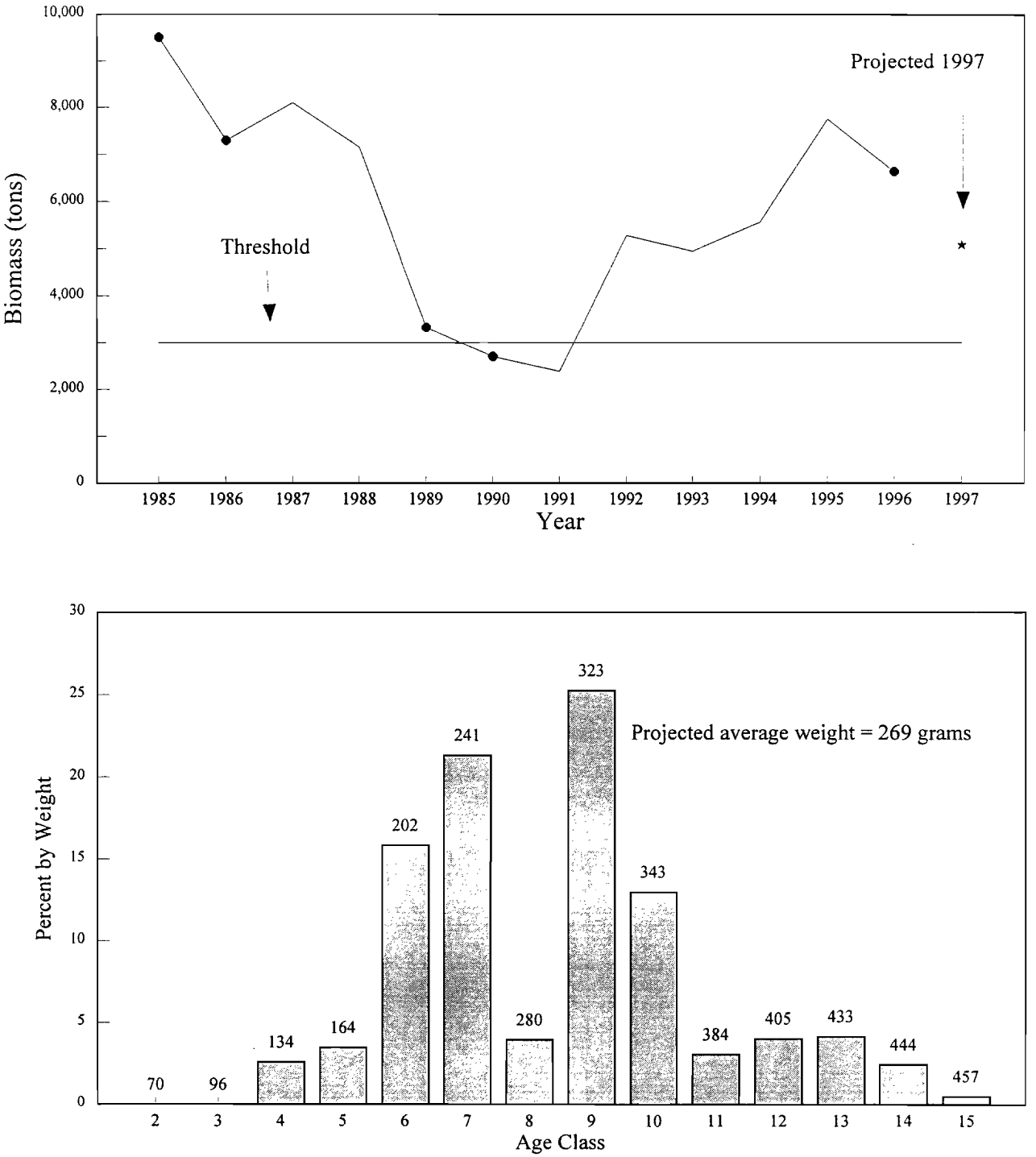

Figure 4. Nelson Island District herring biomass, 1985-1996, with 1997 projected biomass (top) and age composition by weight of the 1997 projected biomass (bottom) showing the projected weight at age. In some years (•), it was not possible to obtain an aerial survey estimate of biomass; therefore the preseason projection or some other method was used to estimate biomass.

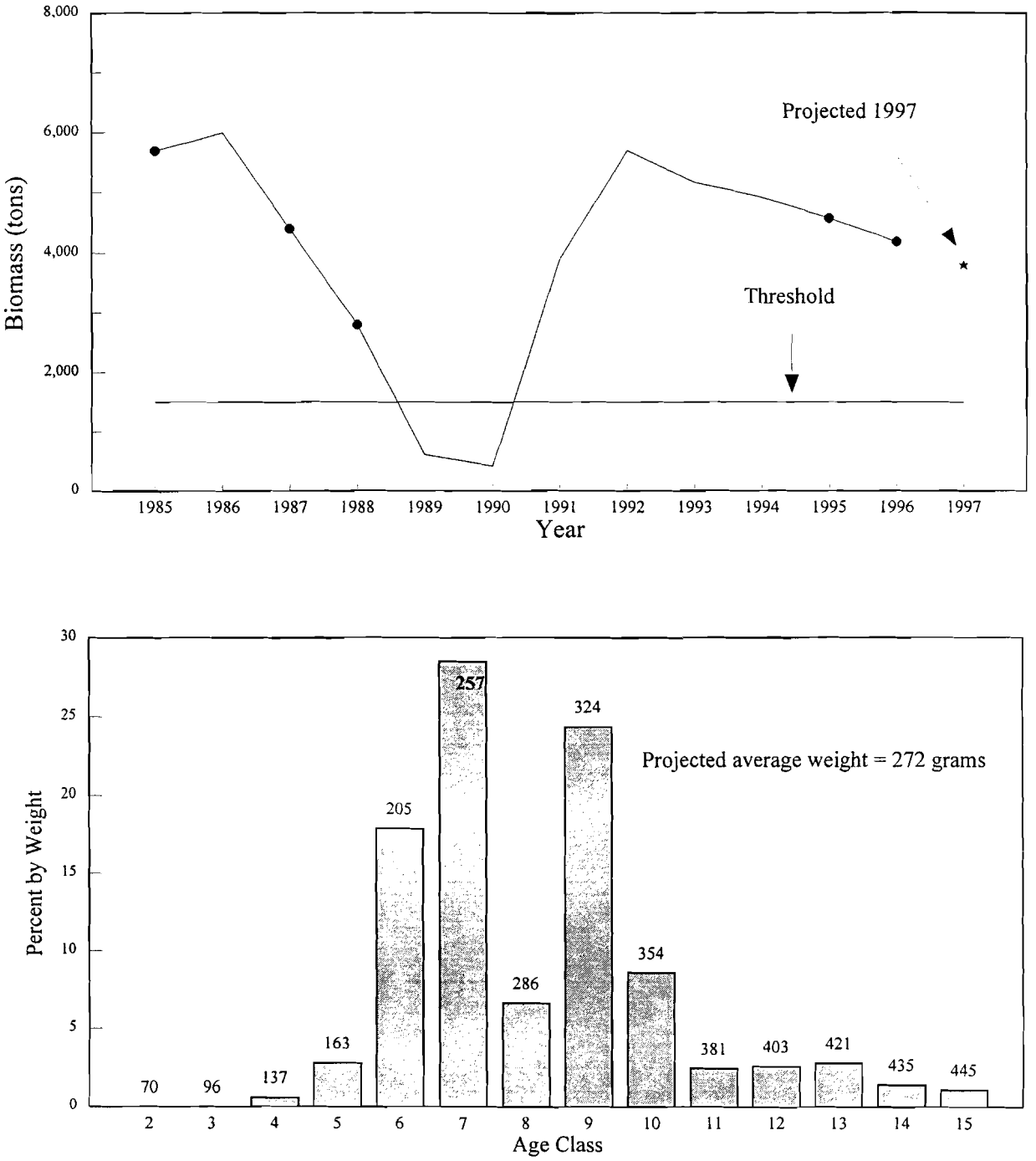

Figure 5. Nunivak Island District herring biomass, 1985-1996, with 1997 projected biomass (top) and age composition by weight of the 1997 projected biomass (bottom) showing the projected weight at age. In some years (•), it was not possible to obtain an aerial survey estimate of biomass; therefore the preseason projection or some other method was used to estimate biomass.

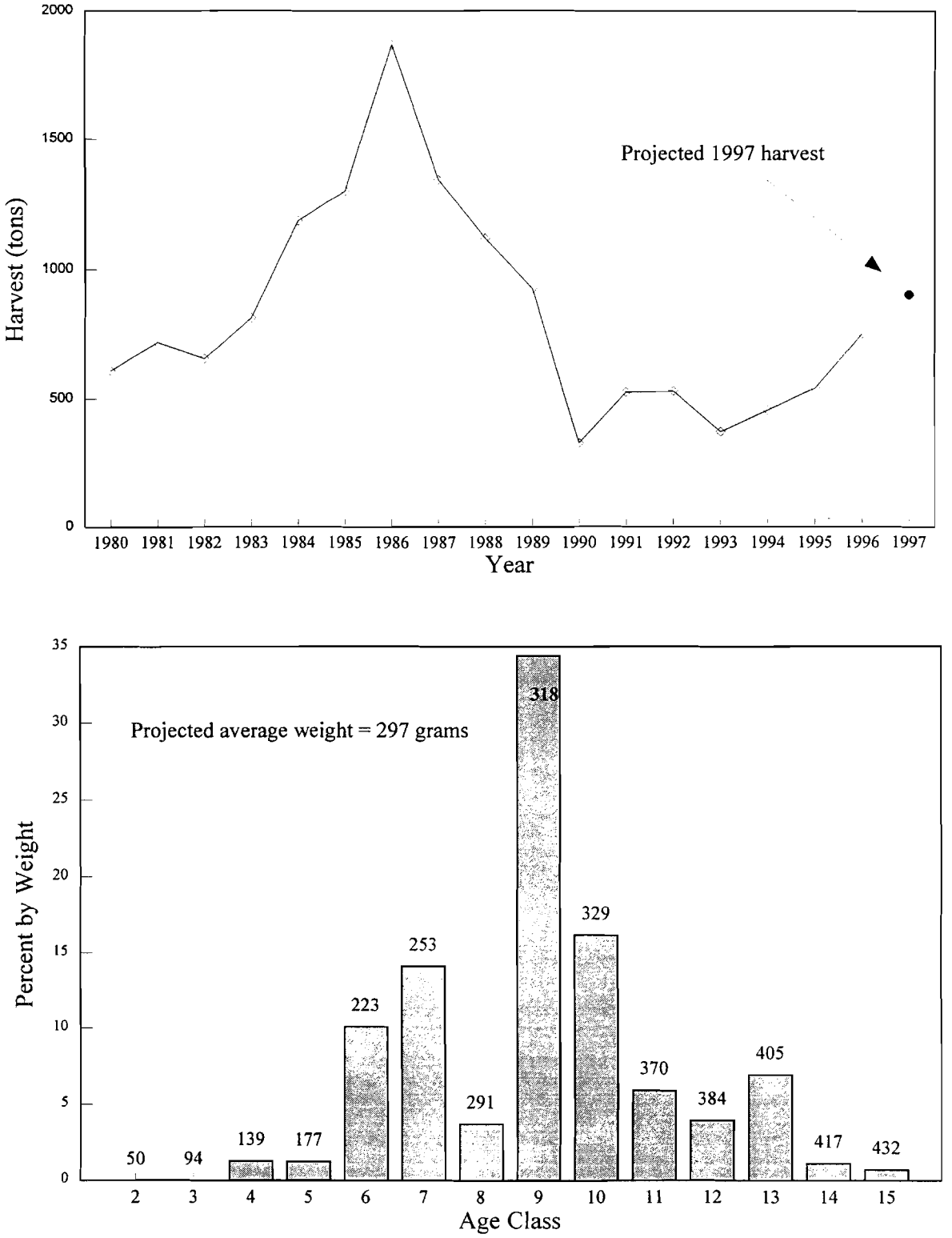

Figure 6. Cape Romanzof District herring historic harvests,1980-1996 with projected 1997 harvest (top), and expected 1997 age composition by weight and weight at age (bottom).

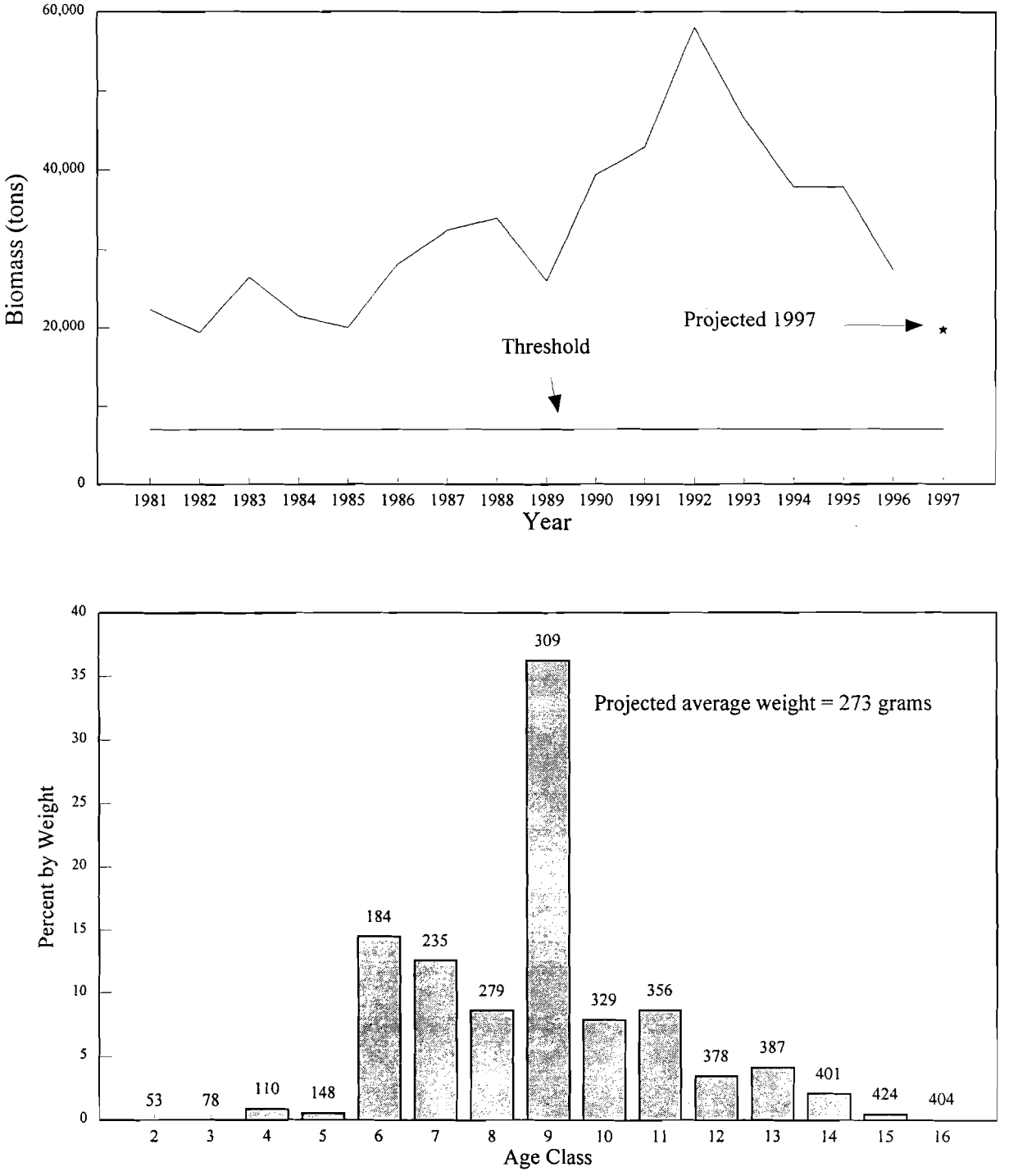

Figure 7. Norton Sound District herring biomass, 1981-1996, with 1997 projected biomass (top) and age composition by weight of the 1997 projected biomass (bottom) showing the projected weight at age.

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